LowPT: Chasing the Dphi problem

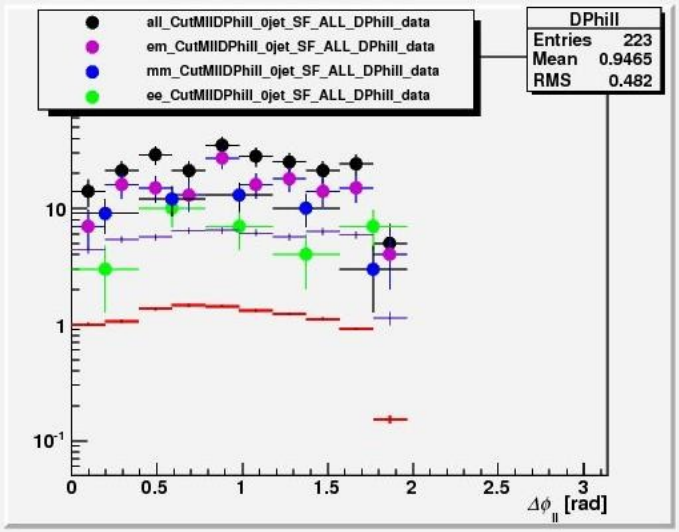
Lina Galtieri, Bill Quayle, Simone Pagan Griso

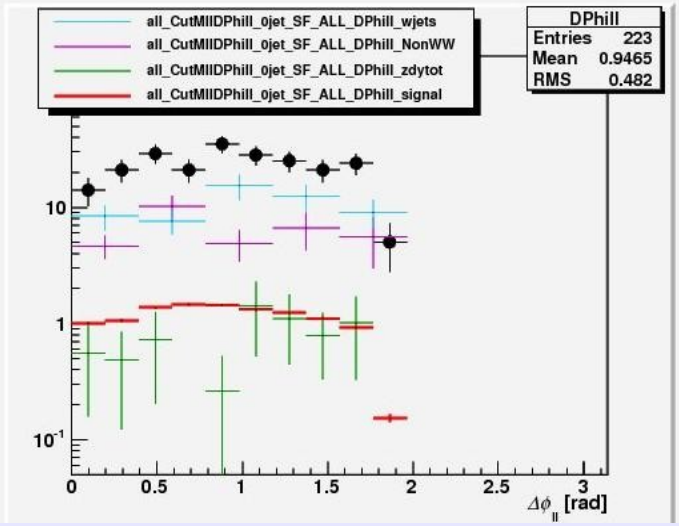
Outline:

Looking at shapes of distributions for data and background in the 2011 sample (2011 analysis)

- Study of Delta(phi) shown on May 7
- Study of Isolation and Impact Parameter
- Study of Delta(eta) (later)

Study of Shapes of distribtutions



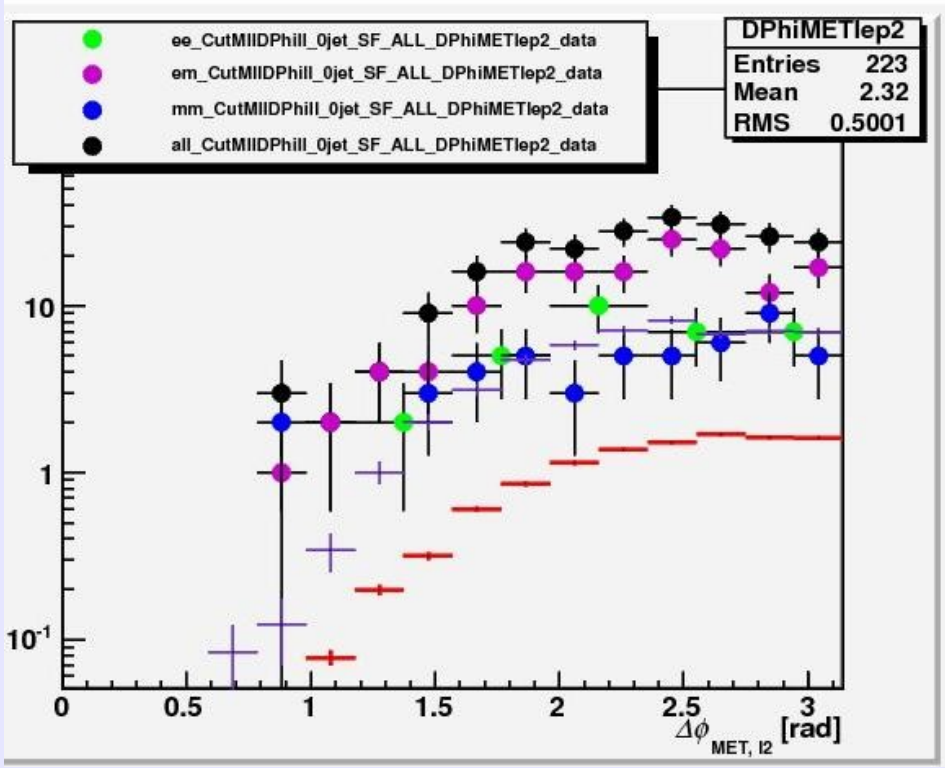


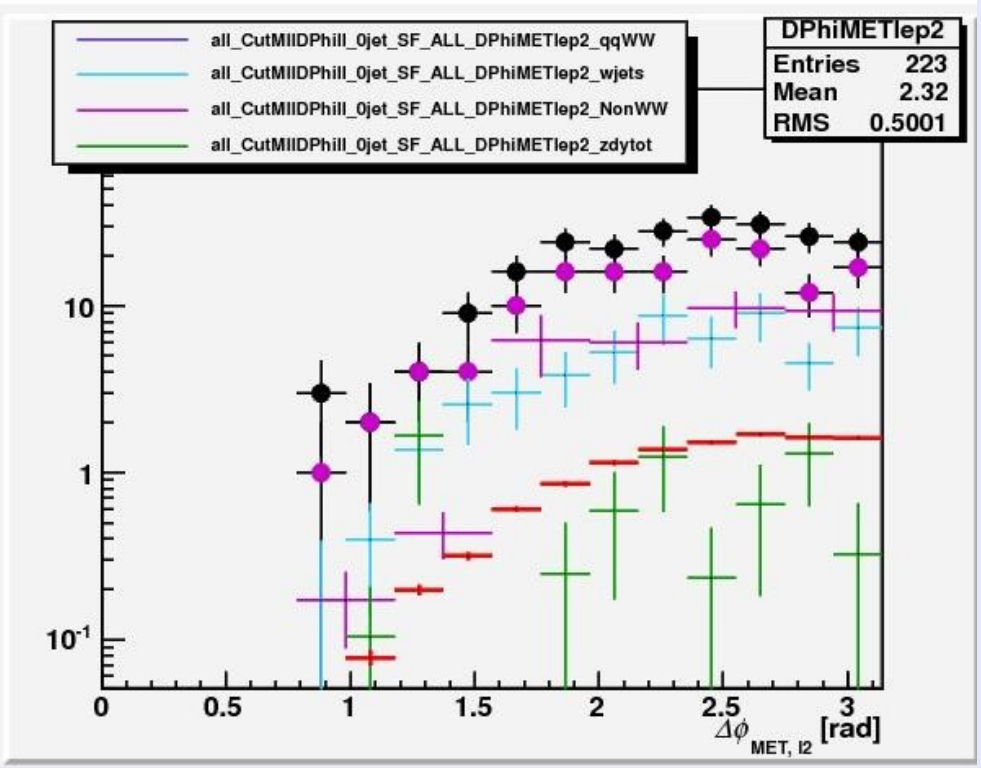
- Looked at shapes of of the $\Delta\phi_{ll}$ distributions for different backgrounds to see if any of them expects an enhancement where we see the excess.

- Turns out that: WW, W+jets and NonWW backgrounds (with present statistics) have a distribution not too different from signal for $\Delta\phi_{ll} < 1.8$.

Delta(MET-Sublead lepton)

Looked at angle between the MET and the SubLead Lepton.
Data agrees with background shapes.





Isolation and Impact parameter Studies

- Will compare Iso variables and impact parameter distributions for events with a muon as SubLead with those from other categories of events

- Investigate the correlations of Isolation and d0 with the Delta(Eta) anomaly.

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Isolation criteria used in 2011 analysis

- Allow electrons and muons with $10 < p_T < 15$ GeV with tightened isolation requirements
  - → *electrons*
    - **pile-up corrected etcone30/p_T < 0.05**
      - (baseline: corr. etcone30/p_T < 0.14)
    - **ptcone40/p_T < 0.1**
      - (baseline: ptcone30/p_T < 0.13)
  - → *muons*
    - **pile-up corrected etcone30 < -0.25 GeV + 0.058 * p_T**
      - (baseline: corr. etcone30/p_T < 0.14)
    - **ptcone40/p_T < 0.1**
      - (baseline: ptcone30/pT < 0.15)
- Documentation in :
  - → *https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsWWlvlvCutWinter2012*

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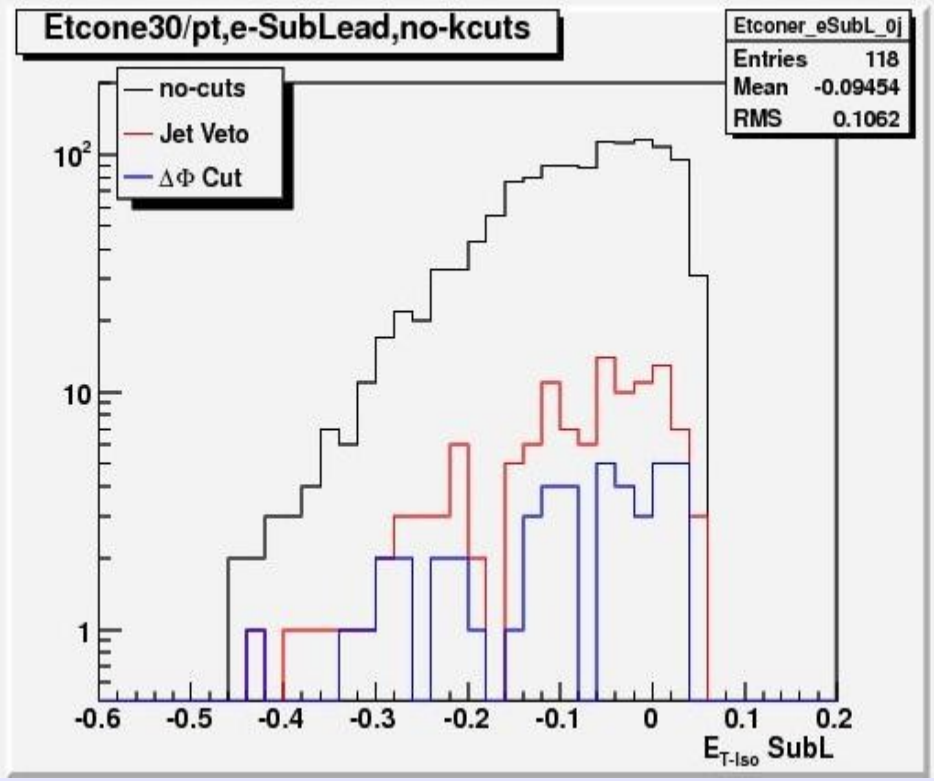
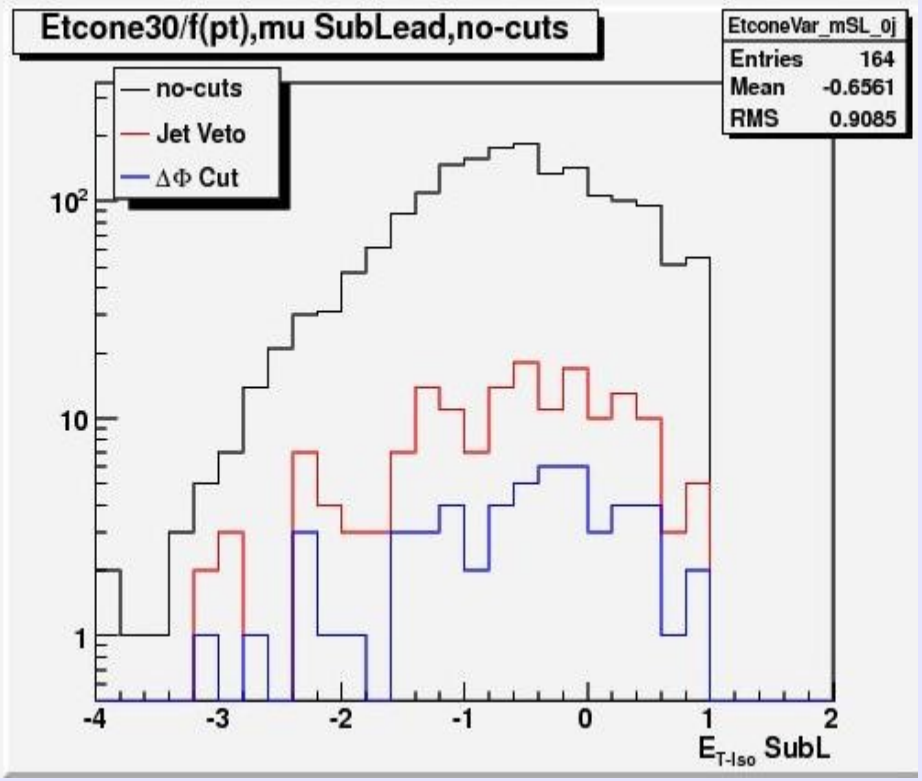
ET-Iso

e Sublead

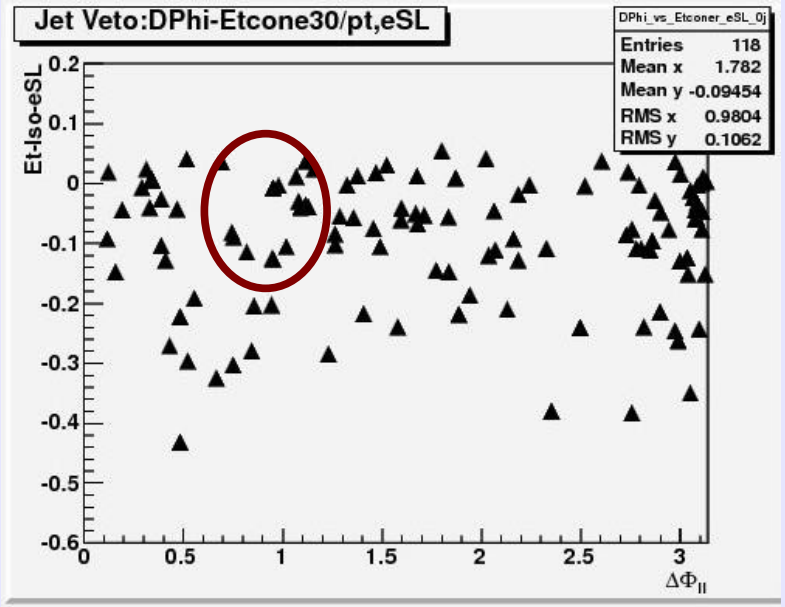


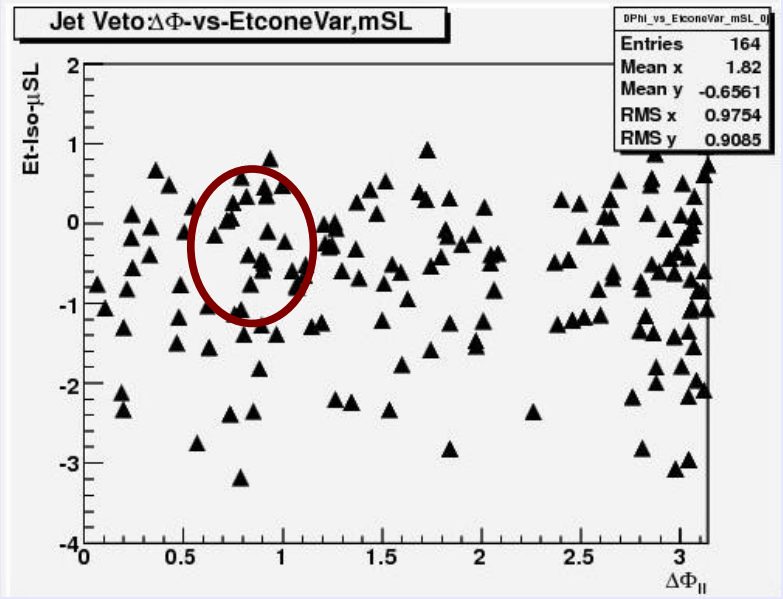
mu SubLead



This shows that the shape of the distributions remains the same as we go from no-cuts, Jet-veto to final plot (DPhi<1.8)

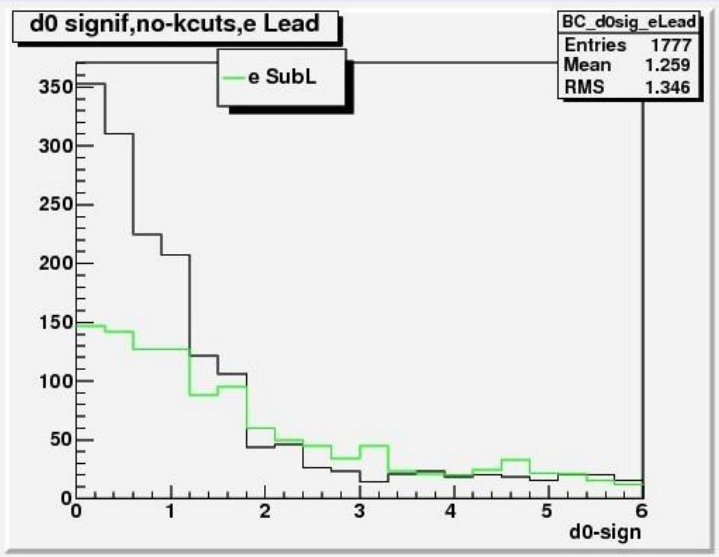
ET-ISO vs DELTA(PHI)

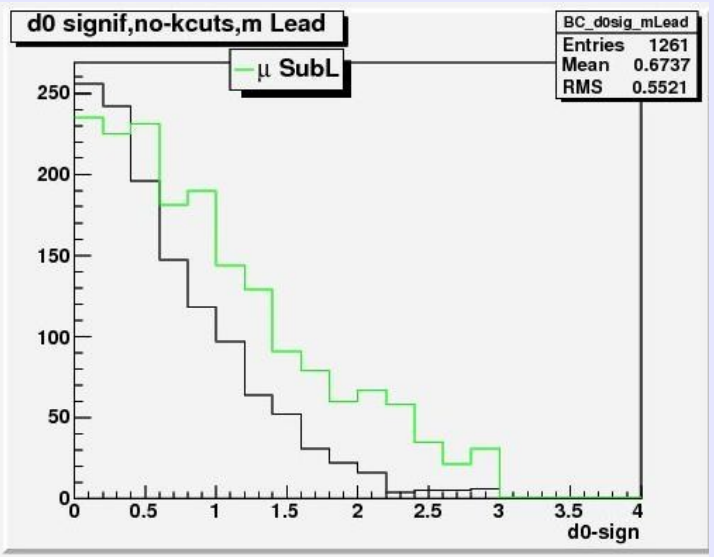


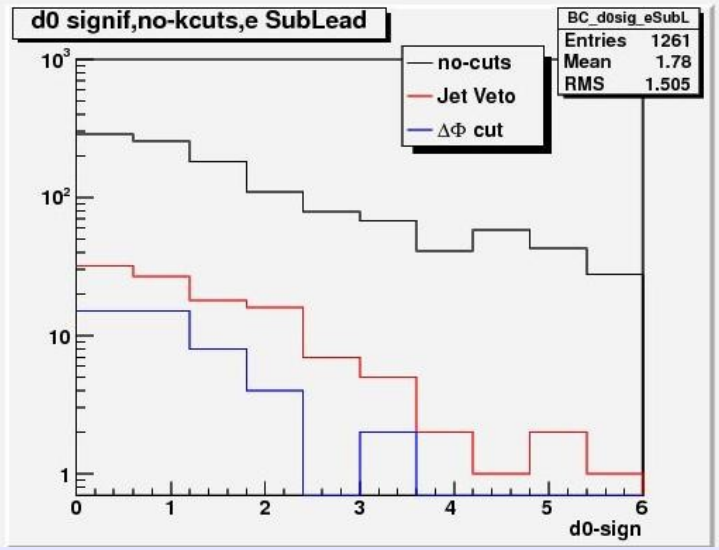


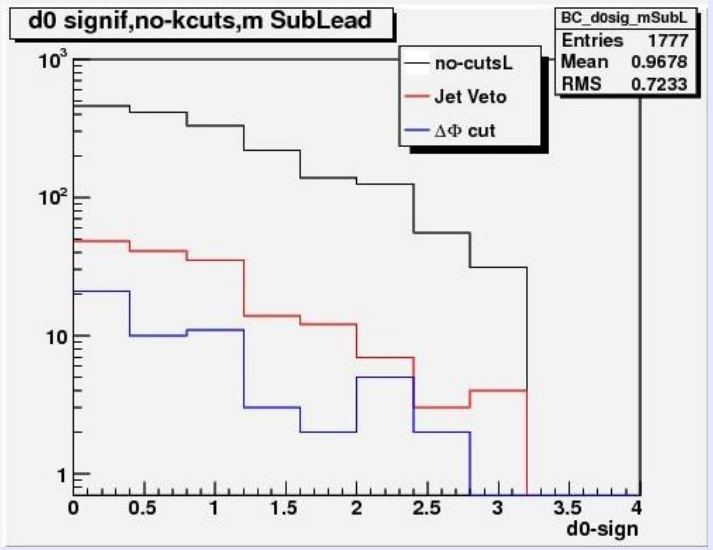
- The region where the excess is, corresponds to the peak of the Isolation distribution.
- This is true for both the SubLead electrons or muons.
- Very few outliers

Impact parameter significance





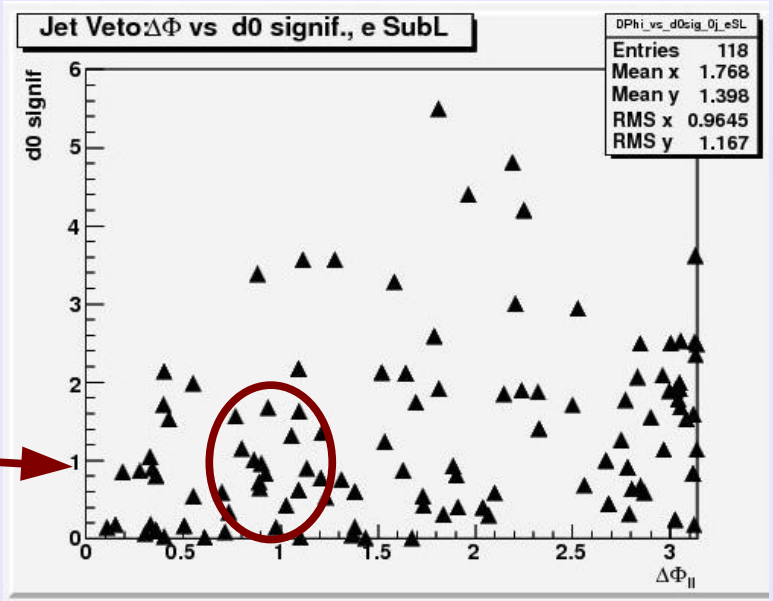




- Lead and Sublead d0 have different distributions

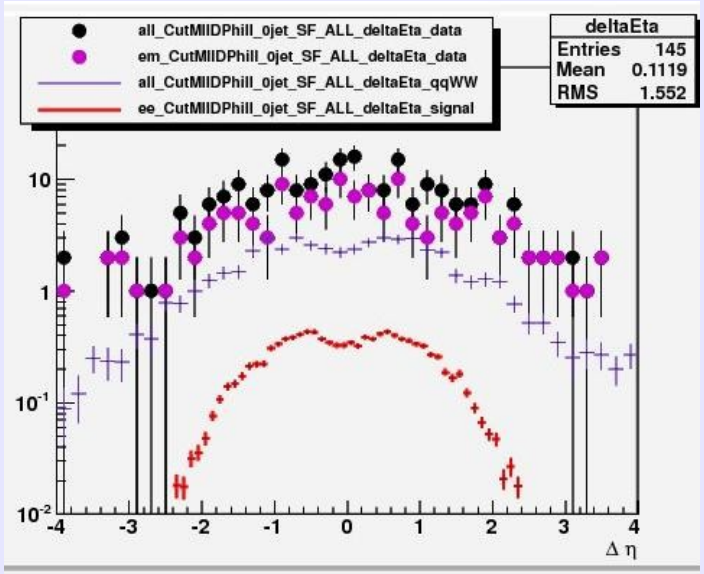
- For Sublead e or mu, the shape remains the same as we go down the cut flow

D0 SIGNIFICANCE-vs-Delta(phi)



- Again, the Dphi region where the excess is, corresponds to the peak of the distribution of the impact parameter.
- No hint about the excess origin so far.

Delta(Etall) Distributions



Δη distributions are shown for a Dphill cut at 1.8 after the Mll cut (Cut0jt?) The 145 events for the em channel.

The Data has a peak at ~0 while the WW and the signal do not.

- The W+Jets distribution (azure), with low statistics (bins are double the size) and the non-W (magenta) backgrounds seem to peak at ~0

- Looked at many scatter plots. No smoking gun yet. What is it correlated with?

Backup Slides

Backup Slides

Flavor Dependence of Excess

Need to understand how Antonio's break trough (contamination of the subleading muons) enters into the excess.

Cutflow for different flavors

Lepton channel	ee	$\mu\mu$	eμ	all
Cut 11				
signal	2.2 ± 0.2	5.1 ± 0.3	13.3 ± 0.9	20.6 ± 1.3
Total Back	159 ± 24	271 ± 33	770 ± 114	1201 ± 170
observed	144	263	828	1235
Jet Veto				
signal	1.4 ± 0.1	3.3 ± 0.3	8.9 ± 0.8	13.6 ± 1.2
Total Back.	41 ± 9	80 ± 15	255 ± 63	376 ± 85
observed	43	81	282	406
$P_{T,\mu} > 45,30$ GeV				
signal	0.76 ± 0.08	1.6 ± 0.2	7.5 ± 0.7	9.8 ± 1.9
Total Back.	9.7 ± 3.1	15 ± 2	90 ± 10	115 ± 14
observed	6	20	117	143
Final Sample, with $\Delta\Phi < 1.8$				
signal	8.9 ± 0.8	0.7 ± 0.1	1.6 ± 1.1	6.6 ± 0.6
Total Back.	9.3 ± 3.0	14.2 ± 2.3	73 ± 8	96 ± 11
Observed	5	**19**	**100**	**124**

excess

excess

No excess in ee, excess in both eμ and μμ